OdonataCentral: The Past, Present and Future

John C. Abbott, The University of Texas at Austin, Austin, Texas <jcabbott@mail.utexas.edu>

At the 2010 DSA Annual Meeting in Orono, Maine, I gave an update of OdonataCentral, <http://www.odonatacentral.org>, and promised a write-up describing the history of OdonataCentral, where things currently stand, and where I hope to take it. While doing this, I took the opportunity to crunch some numbers and see just who is using the site.

The Past

In November of 2004, I relaunched my South-central US regional web site, OdonataCentral as a web site with national coverage sponsored by my museum, the Texas Natural Science Center at the University of Texas at Austin. At the time, it relied on the novel incorporation of existing World Wide Web, database, and geographic information system (GIS) technologies to produce a truly dynamic, interactive field guide and web site for the dragonflies and damselflies of North America. See Abbott and Broglie (2005) for a full discussion of the initial version of this web site.

At the heart of OdonataCentral lies the North American Dot Map Project. Started in 1994, the project involved the efforts of more than 100 contributors from the Odonata community to accurately document and amalgamate the distributions of all North American odonate species through 2004. A three volume hard copy set of the data was published (Donnelly, 2004a,b,c).

It was the realization of the tremendous value of such a massive wealth of vetted digital data that lead to the expansion and relaunching of OdonataCentral in 2004 with several subsequent updates and enhancements (Abbott, 2006, 2007a). In addition to just making the Dot Map data available online, I wanted to continue forward by having a community web site that served as the central repository for all North American records. In 2004, one of the novelties of OdonataCentral was that it allowed and solicited community involvement. Anyone could submit new species locality records to the site. Submitted records have to be vouchered by either photographs or specimens. Outside of museum and private collections, nearly all records submitted are vouchered with photographs. Digital photos can be uploaded to the site and linked to the user's record entry.

New records were vetted by regional experts and incorporated into the site based on the expert's determination. The originator of the record is then recognized in perpetuity for the record and accompanying information. This turns out to be a driving force for many contributors. The ability to add to the odonate knowledge base is appealing to many as is the ability to view their contributions.

The early version of the web site was developed by an employee and myself. Neither of us were computer programmers, but we had some computer background, a lot of enthusiasm, and very hard heads. The site was a real mish-mash of languages, but it worked. We used ESRI's ArcIMS software to power the Odonata Distribution Viewer. It was a powerful tool that allowed users to visualize the geographic distribution of dragonflies and damselflies across North America. Users could zoom, pan, and query the distribution of any North American species to view species limits geographically, find gaps in county records for selected species, or generate accurate county checklists. Anyone who has used ESRI's software knows that for all of its power and potential, it has to rank as some of the most onerous software to use.

A number of issues immediately came up with the site. First, at this point, the site was still running off of a server housed under the desk in my office and I did not have the IT support and redundancy really required for a site like this. Second, the ArcIMS software we were using literally crumbled under the magnitude of the records we were dealing with. Third, users became frustrated, rightfully so, because the records they submitted were sent to a holding area that was only visible to record vetters and there was no real feedback system in place. These two issues, along with the overall desire to improve the site, lead to yet again, a complete overhaul of the site (Abbott, 2007b). This time, my museum director came up with $30,000 to put towards the development and enhancement of OdonataCentral. With these funds, I hired a local computer programmer to rewrite the site, make it more stable, improve functionality and we added a number of features.

Some of the major changes to the site included expanding it to world-wide coverage, we abandoned ESRI's ArcIMS software and went with a Google API to power the Odonata Distribution Viewer, and user submitted records were now immediately visible as pending. The site also incorporated the Dragonfly Society of the America's web site, including membership information and online journal access. In addition, the site took on a new, much spiffier look, was moved from under my desk to official UT servers, the database was moved to an Oracle server, and many elements of the site were vastly improved (Abbott, 2007b, 2009).

Two big downsides I hadn't predicted however, occurred simultaneously. The first was that I was lead to believe the Oracle server now powering OdonataCentral would be dedicated and fast. It turns out that the server is shared with some major university resources that resulted in dramatic slow downs and erratic behavior at times. I also ended up losing nearly all the control I had over the site with the redesign. Though it had been vastly improved, as money dried up and the programmer found more lucrative opportunities in the gaming world, I essentially lost any control I once had over the site. I am able to only make minor changes to certain pages throughout the site. One of the biggest problems that came up was the inability to incorporate large datasets (including the University of Texas Odonate collection) in the database. Without the programmer, I have had no way to even update the UT's collection and I have large datasets from many other collections and individuals that ultimately need to get incorporated into OdontaCentral.

It became clear that funding was the necessary, but missing, component to move OdonataCentral forward. The financial support from the museum has dried up and I have begun exploring other sources. In 2009, I was the Principle Investigator on a large multi-year collaborative National Science Foundation proposal to database the major North American odonate collections with large Neotropical holdings. All of the subsequent digitized data would be captured and disseminated by OdonataCentral and used to help complete the IUCN (International Union for the Conservation of Nature) Odonata Specialist Group, for which I am a member, Global Dragonfly Assessment (von Ellenrieder, 2009). As a result, the proposal included funds to make further improvements to OdontaCentral. It was met with "very good" and "excellent" reviews, but was not funded. In order to strengthen the proposal and ultimately make ourselves more competitive, I felt like we needed to show how OdonataCentral could be used in a creative and novel way and I began looking for someone or some group that could help get my ideas for the web site actually implemented. At this point, I discovered the Texas Advanced Computing Center (TACC, <http://www.tacc.utexas.edu>). This is a well-funded ORU (Organizational Research Unit) at the University of Texas who is interested in collaborating with researchers to archive and disseminate data. After several meetings, we have now plotted a course forward for OdonataCentral.

Table 1. The number of user-submitted records to OdonataCentral by country.

Continent	Country	# of records
South America	Ecuador	1
South America	French Guiana	1
South America	Peru	1
North America	Netherlands Antilles	1
North America	US Virgin Islands	1
Caribbean	Antigua And Barbuda	2
Caribbean	Trinidad and Tobago	2
South America	Bolivia	3
North America	Aruba	9
Caribbean	Dominican Republic	10
Central America	Costa Rica	12
North America	Puerto Rico	22
Central America	Nicaragua	29
Central America	Panama	33
North America	Canada	40
North America	Mexico	81
North America	United States	15,514

The Present

I'm working with TACC to migrate OdonataCentral from the Oracle server at UT to TACC's MySQL server. This will ultimately provide me more control and allow TACC to work with me on maintaining the site and ultimately making improvements to it. This migration will happen during December and should result in only limited interruption to the OdonataCentral web site. I will then be working with TACC to see what is possible in the short run and ultimately they will partner up with us on the resubmission of the National Science Foundation proposal in August of 2011.

A subtle, but significant change that occurred in 2010 was to pull the scope of OdonataCentral back from worldwide to only the New World. There are well-established databases already in place that are collecting distributional records for the Old World. A couple hundred records from the Old World had been submitted to OdonataCentral, but this was a small percentage of the overall record submissions and it has been a struggle just to keep up with the vetting of New World Records.

TACC was able to help me extract some data from OdonataCentral that I wanted to share. This is all based on data up through August of 2010. OdonataCentral is quickly approaching 1,500 registered users and over 16,000 user submitted records. Of those, 353 (24%) users have submitted at least one record. Most of the records have been submitted by a relatively small number of users however. One user has submitted over 1,000 records, 39 users have submitted over 100 records, and 92 users have only submitted a single record.

The distribution of record submissions is, not unexpectedly, strongly skewed towards the United States (Table 1). In addition there have been 14 records submitted for three

islands in the Caribbean, six records for four countries in South America, and 74 records across three countries in Central America.

Within the United States, records are also strongly skewed (Table 2). Over 15,000 records have been submitted from 48 of the 50 states; no records have been submitted for Rhode Island and West Virginia. Nearly 22% of the records submitted have been from Texas.

Records have been submitted for 484 different species. Thirty-seven of those have more than 100 submissions and represent 44% of all user submitted records. The top 10 species (Table 3) represent 16.7% of user submitted records. Sixty-eight (14%) species have only had a single record submission and 222 (46%) species have had 10 or fewer submissions.

There has been a continuous increase in the average number of user submissions over time (Fig. 1). To me, this really shows, despite some of its limitations, people are taking advantage of and using OdonataCentral. Vetting has been a bit arduous at times because of the large number of records and relatively few vetters. Currently, there are 11 record vetters. Three of whom have vetted 75% of the user submitted records and one, nearly 50%. Despite these sometimes overwhelming numbers, records are getting vetted at a rate that is more-or-less on par with their submission (Fig. 1). I have outlined some ideas in the Future section as to ways that I think OdonataCentral can change to better accommodate the need for timely feedback of submissions.

The Future

As mentioned above, funding is the most serious limiting factor at the moment for moving OdonataCentral forward. I am working with TACC and a number of North American collaborators to resubmit a NSF proposal in August of 2011 that would provide some funding to improve and enhance OdonataCentral. In the short run, I'm hoping that the migration of the web site to TACC servers will provide me greater control.

I have many ideas for the enhancement of OdonataCentral. One of the major areas for improvement is the user interface and the self-populating menus that have given some users fits. Another major goal is to provide an interface that will allow users and curators to upload large, previously vetted datasets, to OdonataCentral. The current inability to do this is a big shortcoming of the web site. It presents some major challenges (checking data like state names, county names, species names, user names, etc. for consistency), but there are ways to do this and I feel confident we will get there. My goal has always been to have a single, up-to-date resource to consult for the distribution of New World Odonata. There are lots of sites and individuals that of course keep track of records on smaller park, county, and state scales, but I hope to find an efficient way to "connect" the data of these sites to OdonataCentral.

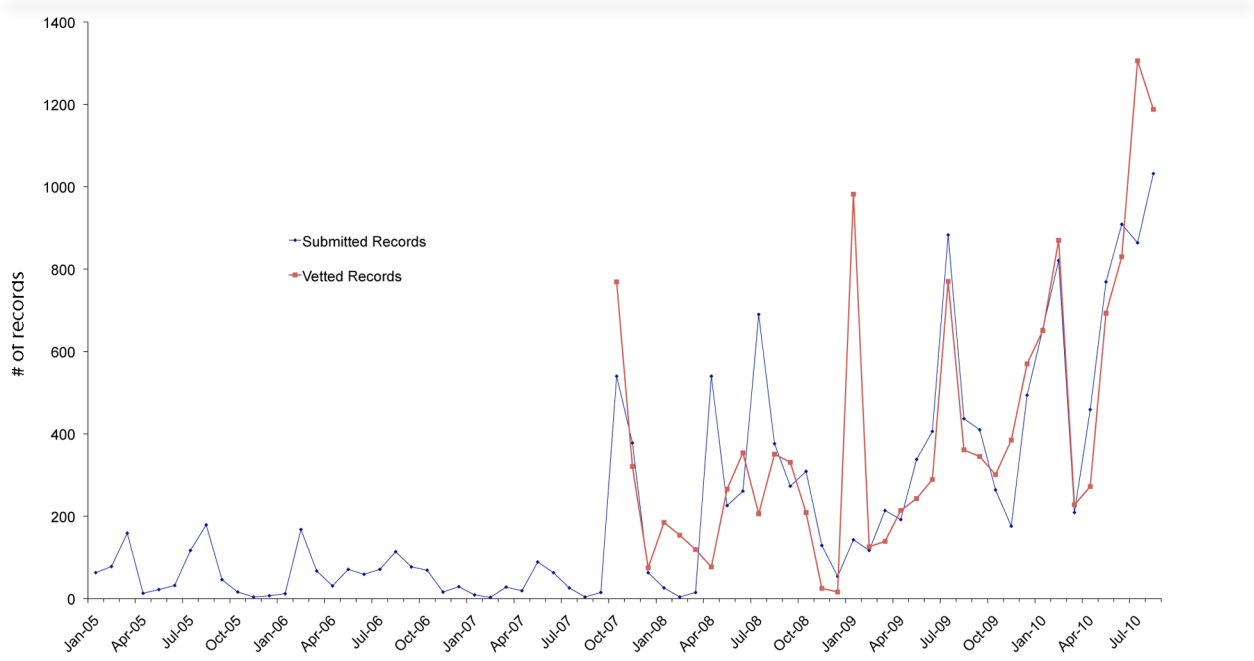

Figure 1. Time series of the number of users submitted and vetted records in OdonataCentral. Data for vetted records was only available beginning October 2007.

The larger vision I have for OdonataCentral is to incorporate a Wiki-type interface in to the site. A Wiki interface allows users to collaboratively create and edit web pages using a web browser. This would allow users to upload photos for which they don't have an id. Other users could then comment on it and ultimately place a name on it. This type of identification tool is used by the popular BugGuide web site, <http://www.bugguide.net>, and has proven to be very successful. Once the uploaded georeferenced photo has been assigned to a species, it then can become part of the database of distributional information. Not only would a system like this allow users to submit photos for which they are unsure of the species, but it would also effectively allow all users to participate in the identification, and thus vetting, of the records which would alleviate the pressures put on a few individuals at the moment.

A relatively simple enhancement to the site will be making all submitted photos for records available in the field guide section. A Wiki interface could be used in this part of the site as well. All users could collaboratively contribute to building a field guide to all New World Odonata. For those of you who are unfamiliar with the power of a Wiki interface, Wikipedia (<http://en.wikipedia.org/>) is probably the best example. It has been shown that this online encyclopedia, which is written, edited and managed by all of its users, is more accurate than Encyclopedia Britannica that hires specialists to write on particular topics. The idea is that there is always someone out there that knows more than you do and if you provide them the opportunity to contribute, many will.

As more and more users submit records, the goal is to replace county-level Dot Map Records with actual location-level records. With time, as the database grows, users would then be able to plot seasonal abundance histograms for any geographic scale (a favorite local, park, county, state, or country) much like they do in many bird publications. This is just a matter of collecting data. The more data collected, however, the more difficult it becomes to vet and monitor for integrity. This is where I think a change to the Wiki interface is a partial solution. I however, think it would still be valuable to maintaining the scientific integrity of the data, to have Record Administrators, but I envision a series of algorithms that would flag potentially interesting or suspect records. For example, each species could be assigned to some level of rarity, which along with a calculation of the distance to the next nearest record for that species, might result in a flag that the record should be subjected to more careful scrutiny.

I hope to also setup pages that would automatically keep track of seasonality for any particular area. Right now,

Table 2. The number of user-submitted records to OdonataCentral by US state.

State	# of Records	% of US Records
Texas	3350	21.59%
New Jersey	2089	13.47
Oklahoma	2056	13.25
Tennessee	745	4.80
Montana	586	3.78
Georgia	519	3.35
New Mexico	495	3.19
Florida	455	2.93
New York	454	2.93
Iowa	436	2.81
Louisiana	373	2.40
Oregon	347	2.24
California	286	1.84
South Dakota	278	1.79
South Carolina	276	1.78
Michigan	270	1.74
Pennsylvania	260	1.68
Kansas	256	1.65
Minnesota	228	1.47
Vermont	171	1.10
Indiana	170	1.10
Nevada	157	1.01
Arkansas	155	1.00
Colorado	152	0.98
Missouri	139	0.90
Virginia	107	0.69
Washington	75	0.48
Illinois	68	0.44
North Dakota	67	0.43
Ohio	56	0.36
Maryland	54	0.35
Nebraska	49	0.32
Alaska	40	0.26
Mississippi	39	0.25
Connecticut	36	0.23
Alabama	33	0.21
Wyoming	33	0.21
Arizona	30	0.19
Utah	28	0.18
Delaware	17	0.11
Kentucky	17	0.11
North Carolina	13	0.08
Hawaii	10	0.06
Wisconsin	10	0.06
Idaho	9	0.06
Maine	9	0.06
Massachusetts	6	0.04
New Hampshire	5	0.03
Rhode Island	0	0.00
West Virginia	0	0.00

this is a somewhat arduous task for any singe individual in any single area, but this should be easily managed by regular and automatic analysis of the submitted records.

When we changed the Odonata Distribution Viewer from being powered by ESRI's ArcIMS software to GoogleMaps, we lost some functionality. One of the most desired functions is to be able to link to a species with some constrained geographic distribution (*Anax junius* in Texas, for example). Several web sites have expressed the desire to be able to link to OdonataCentral's maps in this way. I hope that in the near future, that we can make that functionality along with a number of features available again. I would also like to use the OdonataCentral database to generate an updated version of the North American Dot Maps.

Table 3. The number of users submitted records to OdonataCentral by species.

Species	Common Name	Records	% of Total
Pachydiplax longipennis	Blue Dasher	368	2.3%
Erythemis simplicicollis	Eastern Pondhawk	357	2.2
Plathemis lydia	Common Whitetail	353	2.2
Libellula luctuosa	Widow Skimmer	300	1.9
Ischnura posita	Fragile Forktail	265	1.7
Celithemis eponina	Halloween Pennant	264	1.7
Perithemis tenera	Eastern Amberwing	264	1.7
Anax junius	Common Green Darner	250	1.6
Libellula incesta	Slaty Skimmer	233	1.5
Libellula pulchella	Twelve-spotted Skimmer	228	1.4

What Can You Do

One of the most commonly e-mailed questions I get is what records and photos am I wanting users to submit. Ideally, I would love to capture the most data possible. One way to do this would be if OdonataCentral had an easy to use interface, you might ideally choose to manage all of your photographic observations within the site and thus all your records would be captured without any redundancy in the maintenance of data. Some users really enjoy documenting seasonality. That means early on, you may upload 20 photos of a common species for an area, but at 20 different dates. Others are more interested in geographically unique records. In its current form, because all records must be vetted by relatively few Record Administrators, we are requesting that users try and limit their submissions to only new (at the county level) geographic records or new season records at whatever geographic scale you are interested in. This will help ease some of the burden on the Record Administrators.

OdonataCentral continues to evolve, though I recognize it has been slow to do so over the last couple of years and this has frustrated many users and myself. The purpose of writing this note, is to let you know that I am aware of this and I'm continuously looking for ways to improve and enhance the site, but that my hands have been largely tied by lack of funding and expertise recently. I see this as changing though, and I ask for your patience through the process.

OdonataCentral's greatest asset is that it is a community driven web site that has the benefit of many contributors. I am working hard to expand the ability for all users to contribute their time, expertise, and knowledge on an even grander scale. Together, I think we have the potential to really set the bar for these kinds of web sites. The Odonata community is unique in many wonderful ways, so it is only fitting that it is that community that sets the standard by which others are measured.

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